Notebook, N-99-07-17

#1

Calculations

7-17-99.

Storage Battery

Le Blanc – Electro Chem – 196

$PbO + 2H_2SO_4$ aq. + $Pb = 2PbSO_4$ + aq + 87000.

[207+32] 32.1 207.
239 64.
98.1 196.2

239.
196.2 – 196 1.8) 588.6 (327 H_2O
207. 327 54
327.0 523 48
36
126

969.2 gr = 87000 Cal.

969.2 lbs = 87000 × 1.8 = 156600 B.T.U.

1.8
696
87

969) 1566 (162 B.T.U. per lb.
969
5970
5814
1560

162) 2545 (15.7 lb per H.P. hr.
162
925
810
1150

$\frac{15.7 \times 523}{969} =$

15.7 = 1959
7185
9144
9863
9281 = 8.5

7-17-99

Storage Battery
El. Accumulator Co. Cat. / '98
Type F
19 Plates 10½ x 10½
8 hour disc. at 90 Amp
At 2 Volts = 8 x 2 x 90 = 1440 Watt hrs
750) 1440 (1.9 H.P. hr
75
690
675
150

Weight of each element 184 lbs
Weight of cell complete with acid in lead lined tank 415 lbs
Weight of acid in lead tank 124
Weight of acid in lead tank appear 50% higher than glass jars

1.9) 184 (9.7 lbs of element per H.P. hr
171
130

1.9) 415 (218 lbs of compl. cell per H.P. hr
38
35
19
160

1.9) 124 (65. lb acid per H.P. hr
114
100

Tank outside 21 3/4 x 15 x 17 3/4 high over

7-17-99

Type E.

15
~~12~~ plates ~~[illegible] x [illegible]~~ 7¾ X 7¾

Discharge 8 hrs at 35 Amp -

8 X 2 X 35 = 560 Watt hrs - .747 HP hrs -

$$\begin{array}{r} 750)\,560\,(.747 \\ 525 \\ 350 \\ 300 \\ 500 \end{array}$$

Weight of elements 71 lbs —

Rubber jar 8½ X 8½ X 11 —

Weight of acid in rubber 21 lbs.

" of cell comp. with acid in rubber 91.

$$\begin{array}{r} .75)\,710\,(94.7 \\ 675 \\ 350 \\ 300 \\ 500 \end{array}$$
94.7 lbs element HP hr -

$$\begin{array}{r} .75)\,21\,(28 \\ 150 \\ 600 \end{array}$$
28 lb acid HP h -

$$\begin{array}{r} 75)\,91\,(121 \\ 75 \\ 160 \\ 150 \\ 100 \end{array}$$
121 lbs comp. cell HP hr -

---

5 hr disc at 49 amp. 121 X $\frac{560}{490}$ = 138 lbs comp cell per HP h

$7)\overline{968}$ 138

5 hr dis at 70

121 X $\frac{48}{42}$ = 161 lbs per HP hr —

$3)\overline{484}$ 161

7-17-99.

Edison Leland —

Thermal effects —

Formation of Zincate left out —

ZnO = 85400. Zn = 65.0 Cu = 63.4

CuO = 37100 CuO = 79.4

48300

65)79.4(1.22 lb CuO. for 1 lb Zn —
65
144
130
140

483 = 4.6839
1.8 = .2553
4.9392
65 = 1.8129
3.1263

2545 = 3.4056
3.1263
.2793 = 1.9
lb of Zn per HP hr —

1.9 × 1.22 = 2.3 lb CuO per HP hr —
122
38
38
19
23.18

2.3 + 1.9 = 3.2 lb acid per HP hr.

— — — — —

1 lb = 453.6 grs —

Zn = 1.21 gr per amp hr —

1 lb Zn = $\frac{453.6}{1.21}$ Amp hr —

$746 \times \frac{1.21}{453.6 \times 1.9} =$

746 = .8727
121 = .0828
.9555
.9359
.0196 = 1.04 Volts per cell —

1.9 = .2788
454 = .6571
.9359

Thermal Relation 7-17-99

CuN_2O_6 met. 82.200

63.4
28.
96.
187.4

82.2 = 4.9149
1.8 = 2553
5.1702
63.4 = 1.8021
3.3681 = 2330

.1702
187 = 2718
.8984 = 791

8021
2718
5303 = 33.9% Cu

Cu, O, SO_3 aq = 55.960

~~9482~~

63.4
64.
32.1
159.5

56 = 4.7482
1.8 = 2553
5.0035
63.4 1.8021
3.2014 = 1590

.0035
160 = 2041
7994 = 630

8021
2041
5980 = 39.6%

Naumann

Cu, O, N_2O_5 aq = 52410.

187.4

524 = 4.7193
1.8 = 2553
9746
63.4 = 8021
3.1725 = 1490

.9746
187 = 2718
7028 = 504

~~8021~~

33.9% Cu

Naumann

$NiCl_2$ - 74.0 - 93.7

59
70.8
129.8

74 = 4.8692
18 = 2553
5.1245
59 = 1.7709
3.3556 = 2260

5.1245
13 = .1139
.0106 = 1.030

45.4% Ni

93.7 = 9717
2553
2270
7709
45.61 = 2860

2270
1139
1131 = 1300

~~59~~
7709
1139
6570 = 45

79.9
2
1598

$NiBr_2$ 718 cc Wet

59
159.8
218.8

718 = 8561
18 = 2553
6008
59 = 7709
8299 = 6760

6008
~~219 = 3404~~
~~2604 = 1830~~

7709
3404
4305 =
26.9% Ni

718 = 8561
18 = 2553
1114
59 7709
3405 = 2190

1114
219 3404
7710 = 590

Th

NiI_2 - 414 cc Wet

126.8
2
253.6
59
312.6

414 = 6170
18 = 2553
8723
59 = 7709
1014 = 1260

8723
312 = 4942
3781 = 239

7709
4942
2767 = 18.9%

Th

NiO, H_2O - 0.08 cc

59
34
93

608 = 7839
18 = 2553
0392
59 = 7709
1.2683 = 1850

.0392
93 = 9685
.0707 = 1180

7709
9685
8024 = 63.4%

Th

$NiS\,nH_2O$ - 29300 Dry

59
32.1
91.1

193 = 2856
18 = 2553
5409
59 7709
7700 = 589

5409
911 = 9595
5814 = 38

7709
9595
8114
64.8

Th

7

$NiSO_4$ 2293 in wet

59
32,1
64.
155.1

229 = 3598
18 = 2553
6151
59 = 7709
8442 = 6985.

155 = 6151
1903
4248 = 2660
7709
1903
5806 = 38.1%

NiN_2O_4 113 in wet

59
28
96
183

113 = 0531
18 = 2553
3084
7709
5375 = 3450

3084
183 = 2625
0459 = 1110

7709
2625
5084 = 32.2%

Ni, O, SO_3 Aq. 88.100

881 = 19450
18. = 2553
3003
59 = 7709
4294 = 2690

2003
1903
0100 = 1020

38.1%

Naumann

$ZnCl_2$ 97.26 - 112.8

65
70.8
135.8

972 = 1.9877
2553
2450
65 = 8129
4301 = 2690

113 = 0531
2553
3084
8129
4955 = 3130

8129
1335
6794 = 47.8%

2430
136 = 1335
1095 = 1290

3084
1335
1749 = 1490

Th

1.8 = 2553
8129
4424

79.9
159.8
75,900 90,900

$ZnBr_2$ - ~~97.2~~ - ~~113.~~

65
159.8
224.8

~~97.2 = 9877~~ ~~113 = [illegible]~~

759 = .8802 90.9 = 9586
18 = 2553 2553
1355 2139
65 = 8129 8129
3226 = 2100 4010 = 2520

8129
3522
4607 = 28.9%

1355 2139
225 = 3522 3522
7833 = 607 8617 = 727

Th

ZnI_2 - 49.2 - 60.5

126.8
2
253.6
65
318.6

49.2 = .6920 60.5 = .7818
18 = 2553 2553
.9473 .0371
6.5 = 8129 8129
.1344 = 1360 5242 = 1680

8129
5038
3091 = 20.8%

.9473 .0371
319 = 5038 5038
.4435 = 278 5333 = 341

$ZnO\ H_2O$ 82.4 dry

65
34
99

82.6 = .9170 9170
4424 2553
3594 = 2290 1723
99 = 9956
1767 = 1500

8129
9956
8164 = 65.5%

Th

$ZnS\ n\ H_2O$ - 41.5 dry

65
32.1
97.1

415 = 6180 6180
4424 2553
.0604 = 1150 8733
97.1 = 9872
8861 = 769

8129
9872
8257 = 66.9% Zn

Th

7-18-99

To decompose ZnO_2H_2

Zn, O, H_2O, = 82600

1 Amp hr = 1,21 gr Zn

1,21) 65,00 (53,8 Amp hr = 65 gr Zn
605
450
363
930

B.T.U.
1 ~~watt~~ ,293 Watt hr

82,6
3,977
5782
7434
2478
327,9 = B.T.U.

$\frac{328 \times ,293}{53,8} =$

2,5159
9,4669
1,9822
1,7308
,2514 = 1,78 Volt

8514

2514
9315
1829
9170
2659 =

ZnO = 85,4

$\frac{1,78 \times 85,4}{82,6}$ = 1,84 Volts

5637
4099 = 941
9736

2 5100 324
2

2577

132300
98 = 00
34100
132300 | 2646
1640
4615
1025 0
3641

$ZnSO_4$ - 230 — 248.4

65
32.1
64
161.1 | 6500 | 40.3
6449
5600
4833
7670

230 = 3617 - 53417
4424 18 = 2553
8041 = 6370 5 6170
161 = 2068
4101 = 2570

248.4 = 3945
4424
9521 - 8960

65 = 8129
2068
6061 = 40.4 % Zn

3945
2553
6498
2068
4450 = 2770

ZnN_2O_6 - wet 132.3

65
28
96
189

132 = 1213
4424
5637 = 3660

8129
2765
5364 = 34.4 %

5 1213
18 = 2553
3766
189 = 2765
1001 = 1260

ZnO Dry 85.4

65
16
81

85.4 = 9315
4424
3739 = 2370

8129
9085
9044 = 80.2 %

9315
2553
5 1868
81 = 9085
2783 = 1900

Naumann

Zn, O, SO_3 aq. 106.1

161.1 106 = .0257
4424
.4681 = 2940

5 .0257
18 = 2553
5 2810
161 = 2068
.0742 = 1190

Naumann

1.8 = .2553
39.1 = .5922
.6631

18. = 2553
23 = 3617
8936

H_2O = 68.3 water – 58.0 Vapor –

68.3 = 8344 58.0 = 7634
18 = 2553 2553 Vh
.0897 .0187
3010
2553
.0457 = 11.1%
2 = 3010 18 = 2553
.7887 = 61,500 7634 = 58,000

Vh .0897 .0187
2553 3010
8344 = 68.30 7177 = 52250

KOH = 104, — 116.4 Vh
39.1
16.
1
56.1
104 = .50170 116 = .0660
6631 .6631
6801 = 4790 7291 = 5340

5922
7490
8432 = 69.7%

18 = .50170 .0660
2553 2553
.2723 .3213
56.1 = .7490 .7490
.5233 = 3340 .5723 = 3735

NaOH = 102.0 — 111.8
23.0
16.
1
40.
102 = .0086 112 = .0492
8936 8936
9022 = 7980 9428 = 8770

23 = 3617
40 = 6021
7596 = 57.5

105.0086 .0492
2553 2553
.2639 = ~~78~~ .30457
40 = 6021 6021
.6618 = 4590 .7024 = 5040

KSHaq 65.1
39.1
32.1
1
72.2
5922
8585
7337 = 54.2%

65.1 = .8136 48136
6631 18 = 2553
4767 = 3000 5.0689
722 = .8585
.9104 = ~~848~~
1620

Naumann

[illegible]

NaSH aq − 60,450

23 / 32,1 / 11 / 56,1

604 = 7814

M 11 8936 56,1

6750 = 4730

7814 / 2553 / 0367 / 7490 / 2877 = ~~477~~ 1940

3617 / 7490 / 6127 = 41% Na

Naumann −

KCl − 105,6 − 101,2

39,1 / 35,4 / 74,5

105,6 = ,0232 / M 11 6631 / 6863 = 4860

101,2 = ,0095 / 6631 / 6726 = 4710

5922 / 8722 / 7200 = 52,5%

18 = 0232 / 2553 / 2785

745 = 8722 / 4063 = 2550

0095 / 2553 / 2648 / 8722 / 5926 = 2470

Th

nil M 24

NaCl − 97,6 − 94,5

23,0 / 35,4 / 58,4

97,6 = 9894 / M 11 = 8936 / 8830 = 7640

96,5 = 9845 / 8936 / 8781 = 7550

3617 / 7664 / 5953 = 39,4

18 9894 / 2553 / 2447

58,4 = 7664 / 4783 = 3010

9845 / 2553 / 2398 / 7664 / 4734 = 2970

Th.

K2SO4 − 344,5 − 337,2

78,2 / 32,1 / 64, / 174,3

344 = 5372 / 18 = 2553 / 7925

78,2 = 8932 / 8993 = 7930

337 = 5279 / 2553 / 7832 / 8932 / 8900 = 7760

8932 / 2413 / 6519 = 44,9

174 = 7925 / 2413 / 5512 = 3560

7832 / 2413 / 5419 = 348

Na_2SO_4 328.5 — 329.0

46
32.1
64.
142.1

328 = 5165 — 329 = 5172
18 = 2553 — 2553
7718 — 7725
46 = 1.6628 — 6628
1090 = 12.900 — 1097 = 12900

6628
1526
5102 = 32.4% / 142 = 7718 — 7725
1526 — 1526
6192 = 4160 — 6199 = 4170

K_2O, SO_3 aq — 195.8

78.2
32.1
64
174.3

195 = 2919 — ~~2918~~
18 = 2553
5472 — 5472
39.1 = 15922 — 174 = 2405
.9550 = 1135 — 3067 = 2030
2|9020
4510

7-19-99-
Electrolysis -
~~At~~
20% $NaOH$. Sol. containing
Zn & impurities - gradual
increase voltage - Plat. electr.
small amount of gas from - elec.
at 1.2 Volts - about the same
up to 1.5 Volts - A slight Cu
deposit visible after several hrs
The sol. was from small Edison
Cell partially disc - pure $NaOH$ -
At about 1.4 Volt begin to
gas at + elec -
Get Zn at about 1.9 Volt -
Slight deposit, apparently
Cu at 1.6 Volt -

7-19-99

Electrolysis

25% NaOH sol. ZnO_2H_2 added and Cu dissolved from sheet Cu anode —

Cu begins to deposit at 1.2 Volt voltage gradually raised to 1.6 Volt deposit bright at first turns black.

Gas from + at 1.6 Volts —

Cu all comes out in time, no Zn visible at 2 volts — but may have come on black deposit —

Theoretical Battery — 16.

7-22-99

20 plates for Zn 10½ × 42"
Total area 21 × 42 × 20 = 17,640
Weight of Zn per .001" deposit
17.64 ÷ 4 = 4.41 lb
1.9 lb Zn per H.P. hr (p. 4)

.001" deposit $= \frac{4.41}{1.9} =$ 2.32 H.P. hr.

1.9)4.41(2.32
38
61
57
40

121
22
242
242
266

1 H.P. hr $= \frac{.001}{2.32} =$ .000431" deposit

1 Amp. hr. per sq in. = .00121 × 2.2 = .00266 lb

1 Amp hr per sq. in. for cell = .00266 × 17640 = 46.9 lb

1764
266
10584
10584
3528
469224

1.9)15.6(821
152
40
38
2

1 Amp hr per 3 sq in = $\frac{46.9}{3}$ = 15.6 lb Zn [illegible]
cell $= \frac{15.6}{1.9} =$ 8.21 H.P. [illegible]

1 Amp hr per 3 sq in. $= \frac{8.21}{2.32} =$ .00[illegible]

2.32)821(354
696
1250
1160
900

Ni grids .003" thick

Weight 8820 x .003 x .317 = 8.35 lb Ni.

882 = 3.9455
3 = 7.4771
317 = 9.5011
.9237 = 8.35

Ni ~~Zn~~ plated with iron .001" all over

Weight of Fe 8820 x .002 x .26 = 4.59 lb Fe

3.9455
52 = 7160
.6615 = 4.56

Assume 1 amp-hr on 3" the limit — 15.6 lb. Zn. (pp. 16)

pp. 4) 15.6 x 1.22 = 19.0 lb CuO required

122
312
312
156
19.032

Sp. gr. CuO = 6.3

$\frac{19.0}{6.3 \times .036}$ = 83.8 cu in. solid CuO

6.3 = .7993   19 = 1.2788
36 = 8.5563   9.3556
9.3556   1.9232 = 83.8
41.9
125.7

With 33% voids   125.7 cu in. gross

21 ~~19~~ grids — $\frac{125.7}{19 \times 10.5 \times 10.5}$ = 21)114(54
19
105
90

19 = 1.2788   126 = 2.1004
110 = 2.0414   3.3202
3.3202   ~~4208~~
8.7802 = .055" ~~.060~~ thick over

Allowing for ▭▭ make space in grid = .07"

Ni grid for CuO

$\frac{8.35}{20} \times \frac{19}{2} = 3.97$ lb Ni in grid

835
19
7515
835
4)15865(3.97

---

20 plates in = 1/4" thick = 5"
~~21~~ 42" ▭▭ .08 " 1.68"
~~38~~ spacers 3/8" " 15.8
22.5
1/4" inch on ends — 23" inside
11 × 11 × 23 — — 7 cell

Vol of cell 11 × 11 × 23 = 2783 cu in

121
× 23
363
242
2783

2783
141
2642

Vol Ni = 3.97 + 8.35 = 39. cu in
.317)12.32(39
951
2810

Vol iron = 18 cu in
" CuO = 84 " "
141. " "
" sol 2783 − 141 = 2642 cu in

Sp gr sol — 25% = 1.28
Weight .0361 × 2642 = 95.4 ~~lb~~

.0361
2642
15852
7926
95.3762

4) 95.4 lbs [illegible]
23.85 lb NaOH

Equal [illegible] 12 [illegible]

4) 122 lb [illegible]

2) 30.5 lb → NaOH

15.25 lb Zn

7.62 HP hr

Total weight of cell

173.9 lb

Weight per HP hr

7.6) 173.9 (23 lb
152
21.9

95.4
12.8
7632
1908
954
1221.12

8.35
4.59
19.00
3.97
16.00
122.00
173.91 lb

7-25-99

Iron Deposits

see pp 34

Iron sulphate, $FeSO_4$ with about ½ the amount NH_4Cl does well, iron sat.

Addition of a little HCl and iron anode seems to improve it.

NH_4Cl with iron anode gives best deposit but sol. oxidize rapidly.

$FeSO_4$ & NH_4SO_4 fair.

NH_4CO_3 N. G.

$FeSO_4$ precip by NH_4CO_3, and redissolve in HCl. fair.

$FeSO_4$ & Ammo. Oxalate fair.

7-26-99

Na_2, O, SO_3 - aq - 186,640

142,1

187 = 5,2709
18 = ,2553
5,5262
44 1,6628
3,8634 = 7,300

5262
142 1526
3736 = 2360

Naumann

$K_2, O,$ aq 164560

78,3
16
94,3

164 = 5,2160
18 = ,2553
5.4713
78,3 1,8938
3,5775 = 3780

5,4713
94,3 1,9745
~~4458~~
3,4968 = 3140

1,8938
1,9745
9,9193 = 83%

Naumann

Na_2O aq - 155260

46
16
62

155 = 5,1911
18 = ,2553
5,4464
44 = 1,6628
3,7836 = 6080

4464
7924
6540 = ~~37~~ 4510

6628
7924
8704 = 74.2%

Naumann

HCl = 22000 - 39300

35,4
1
36,4

22000 = 4,3424
18 = ,2553
4,5977 = 39600
364 5611
4,0366 = 1090

393 = 4,5944
,2553
4,8497 = 70700
364 = 1,5611
~~[illegible]~~
3,2886 = 1940

$\frac{39600}{364}$ =

Ostwald

H_2SO_4 = 193,100 - 210900

2
32.1 193 = 5.2858 211 = 5.3241
64. 18 .2553 2553
98.1 5.5411 5.5794
2 = .3010 .3010
3010 5.2401 = 174000 5.2784 = 190000
9917 5.5411 5.5794
3093 = 2.04% 98.1 = 1.9917 1.9917
3.5494 = 3540 3.5877 = 3870
3065 5.5411 5.5794
9917 32.1 = 1.5065 1.5065
5148 = 32.7% 4.0346 = 10800 4.0729 = 11800

SO_3 = 103300 - 142500

48.
32.1
80.1 103 = 5.0140 142 = .1538
18 = 2553 2553
5.2693 .4091
per lb SO_3 80.1 1.9036 9036
3.3657 = 2320 .3055 = 3200
per lb H_2SO_4 98.1 = 5.2693 4091
1.9917 9917
3.2776 1890 4174 = 2610

HNO_3 = 41900 - 49100

14
48
63 419 = 4.6222 491 = .6911
18 = 2553 2553
4.8775 = 75400 .9464 = 88400
63 = 1.7993 7993
V7993 3.0782 = 1200 ~~[illegible]~~ .1471 = 1400
2007 = 1.59% H 14 = 1461
7993
3468 = 22.2% N

N_2O_5 = 131000 – 298000

28
80
108

131 = 4,1173 – 298 = 4742
18 = 2553 — 2553
4,3726 — 7295
per lb N_2O_5 108 = 2,0334 — 0334
2,3392 = 218 — 6961 = 497

108
126

per lb HNO_3 = 4,3726
2,1004 — 7295
2,2722 = 187 — 1004
6291 = 426

NH_3 = 12000 20400

120 = 4,0792 — 204 = 3096
18 = 2553 — 2553
4,3345 — ,5649
per lb N = 14 = 1,1461 — 1461
3,1884 = 1540 — 4188 = 2620
per lb NH_4OH = 4,3345 — 4,5649
35 = 1,5441
3,0208 = 1050

H_3PO_4 = 302900 – 305600

3
31
64
98

303 = 5,4813 — 306 = 4851
18 = 2553 — 2553
5,7366 — 7404
3 = 4771 — 4771
5,2595 = 182000 — 2633 = 183000

98 = 5,7366 — 7404
1,9912 — 9912
3,7454 = 5560 — 7492 = 5610

4771
9912
4859 = 3.06%

31 = 4914
9912
5002 = 31.6%

P_2O_5, aq. 2×203000

$\frac{406000}{18} = 5.6085$

2553

5.8638

per lb H_3PO_4 4,196 $= 2.2923$

$3.5715 = 3730$

$KClO_3 = 95900$

39.1
35.4
$48.$
122.5

per lb. $K = \frac{95900 \times 1.8}{39.1} = 4410$

per lb $KClO_3 = \frac{95900 \times 1.8}{122.5} = 1410$

$\frac{39.1}{122.5} = 33.8\%\ K$ $\frac{35.4}{122.5} = 28.9\%\ Cl$

KCl $104300 - 99,900$

per lb $K = \frac{104300 \times 1.8}{39.1} = 4800$ 4800

39.1
35.4
74.5

$\frac{99900 \times 1.8}{39.1} = 4620$

per lb $KCl = \frac{104300 \times 1.8}{74.5} = 2530$

$\frac{99900 \times 1.8}{74.5} = 2420$

$\frac{39.1}{74.5} = 52.5\%\ K$

$Na_2O = 80400 - 135400$

per lb Na $\frac{80400 \times 1.8}{46} = 3150$

$\frac{135400 \times 1.8}{46} = 5300$

per lb $NaOH = \frac{80400 \times 1.8}{80} = 1800$

$\frac{135400 \times 1.8}{80} = 3050$

NH_4Cl 75800 – 71800

per lb NH_4 = $\frac{75800 \times 1.8}{18} = 7580$

$\frac{71800 \times 1.8}{18} = 7180$

per lb NH_4Cl = $\frac{75800 \times 1.8}{35.4} = 3850$

$\frac{18}{35.4} = 51\%\ NH_4$ $\frac{71800 \times 1.8}{35.4} = 3650$

$NH_{4_2}SO_4$ = ~~28~~ 282200 279600

per lb NH_4 = $\frac{282200 \times 1.8}{36} = 14110$

$\begin{array}{r} 36 \\ 32.1 \\ 64 \\ \hline 132.1 \end{array}$

$\frac{279600 \times 1.8}{36} = 13980$

per lb $NH_{4_2}SO_4$ = $\frac{282200 \times 1.8}{132} = 3860$

$\frac{36}{132} = 27.4\%\ NH_4$ $\frac{279600 \times 1.8}{132} = 3810$

NH_4NO_3 = 88000 – 81800

per lb NH_4 = $\frac{88000 \times 1.8}{18} = 8800$

8180

per lb NH_4NO_3 = $\frac{88000 \times 1.8}{80} = 1980$

$\frac{81800 \times 1.8}{80} = 1840$

1698
1872

110.8
34.2
2216
6648
3324
40096

$Ca(OH)_2$ = 214900 — 217900

per lb Ca = $\frac{214900 \times 1.8}{40}$ = 96800

$\frac{217900 \times 1.8}{40}$ = 98500

per lb $Ca(OH)_2$ = $\frac{214900 \times 1.8}{74}$ = 52200

$\frac{40}{74}$ = 54.1 % Ca $\frac{217900 \times 1.8}{74}$ = 53000

CaO = 131000 hydrated ~~[illegible]~~ 146500

per lb Ca $\frac{131000 \times 1.8}{40}$ = 59000

$\frac{146500 \times 1.8}{40}$ = 66100

per lb $Ca(OH)_2$ $\frac{131000 \times 18}{74}$ = 31900

$\frac{146500 \times 18}{74}$ = 35700

$CaCl_2$ = 169800 — 187200

per lb Ca = $\frac{169800 \times 1.8}{40}$ = 76600

$\frac{187200 \times 1.8}{40}$ = ~~27~~ 84200

70.8
40
110.8

$CaCl_2$ $\frac{169800 \times 1.8}{110.8}$ = 27800

$\frac{187200 \times 1.8}{110.8}$ = 30500

$\frac{40}{110.8}$ = 36.2 % Ca

2704
5408
[illegible]

$CaSO_4$ = 318400 — 323100

per lb Ca = $\frac{318400 \times 1.8}{40}$ = 14360

32.1
40.
64
136.1

$\frac{323100 \times 1.8}{40}$ = 14500

$\frac{318400 \times 1.8}{136.1}$ = 4140

$\frac{40}{136}$ = 29.4% Ca

$\frac{323100 \times 1.8}{136.1}$ = ~~14500~~ 4260

$Ca(NO_3)_2$ = 202600 – 206600

per lb Ca = $\frac{202600 \times 1.8}{40}$ = 9110

.64
124
164

$\frac{206600 \times 1.8}{40}$ = 9310

$Ca(NO_3)_2$ $\frac{202600 \times 1.8}{164}$ = 2220

$\frac{40}{164}$ = 24.4% Ca

$\frac{206600 \times 1.8}{164}$ = 2270

$CaCO_3$ = 270400

12
40
48
100

$\frac{270400 \times 1.8}{40}$ = 12180

$\frac{270400 \times 1.8}{100}$ = 4847

40% Ca

[illegible]

821
179
1000

$Fe(OH)_2 = 136700$

34
237
271

$\frac{136700 \times 1.8}{237} = \underline{1060}$

$\frac{136700 \times 1.8}{271} = \underline{910}$

$\frac{237}{271} =$ ~~67.9~~ 87.5 % Fe_2

$Fe(OH)_3 = \frac{198200 \times 1.8}{237} =$ ~~[illegible]~~ 1504

51
237
288

$\frac{198200 \times 1.8}{288} = \underline{1238}$

$\frac{237}{288} = 82.6\%$

Fe_3O_4 $\frac{264700 \times 1.8}{711} = 670$

237
711
64
775

$\frac{264700 \times 1.8}{775} = 614$

$\frac{711}{775} = 92\%$

$FeCl_2 = 82100 = 100.000$

237
70.8
307.8

$\frac{82100 \times 1.8}{237} = \underline{624}$

$\frac{100000 \times 1.8}{237} = \underline{759}$

$\frac{82100 \times 1.8}{307.8} = \underline{482}$

$\frac{100000 \times 1.8}{307.8} = \underline{585}$

$\frac{237}{307.8} = 77.2\%$

901
633
1534

[illegible]

$FeCl_3$ = 96100 — 159400

35.4
3
106.2
237
341.2

$\frac{96100 \times 1.8}{237} = 730$

$\frac{96100 \times 1.8}{341.2} = 509$

$\frac{159400 \times 1.8}{237} = 121$

$\frac{237}{341} = 69.3\%$

$\frac{159400 \times 1.8}{341.2} = 840$

$FeSO_4$ aq $= \frac{235600 \times 1.8}{237} =$ ~~993~~ 1780

237
32
64
333

$\frac{235600 \times 1.8}{333} = 1270$

$\frac{237}{333} = 72.6\%$

$Fe_2(SO_4)_3$ aq $\frac{618400 \times 1.8}{237 \times 2} = 2350$

237
2
474
288
762

96
3
288

$\frac{618400 \times 1.8}{762} = 1460$

$\frac{474}{762} = 62.1\%$

$Zn(OH)_2 = \frac{151100 \times 1.8}{65} = 4190$

34
65
99

$\frac{151100 \times 1.8}{99} = 2750$

$\frac{34}{99} = 34.4\%$

18
14
1998
[illegible]

471
85
2355
3768
40035

$Hg_2O = \dfrac{\overset{111}{222}\cancel{00} \times 1.8}{\cancel{200}} = 2)\dfrac{199.8}{100.}$

$\dfrac{400}{414} = 96.2\%$ $\quad \dfrac{22200 \times 1.8}{216} = \cancel{185}$ 96.2

$\cancel{\dfrac{200}{216}}$ ~~92.6%~~ Hg

$HgO = \dfrac{20700 \times 1.8}{200} = \cancel{186}\ 188$

$\dfrac{20700 \times 1.8}{216} = \cancel{178}\ 172$

$\dfrac{200}{214} = 92.6\%$

$Hg_2Cl_2 \quad \dfrac{62600 \times 1.8}{400} = 281$

$\dfrac{400}{471} = 85\% \quad \dfrac{62600 \times 1.8}{470.8} = 239$

$HgCl_2 \quad 53200 - 49900$

$\dfrac{53200 \times 1.8}{200} = 479$

$\dfrac{33200 \times 1.8}{271} = 354$

$\dfrac{200}{271} = 73.9\%$

$\dfrac{49900 \times 1.8}{200} = 450$

$\dfrac{49900 \times 1.8}{271} = 332$

312
60
2808
1872
1.15.2

637
17
4459
637
10829

ag_2O $$\frac{5900 \times 1{,}8}{\cancel{108}\ 216} = \underline{\underline{49}}$$

$\frac{216}{232} = 91{,}5\%$ $$\frac{5900 \times 1{,}8}{236} = \underline{\underline{45}}$$

$agCl$ $$\frac{29400 \times 1{,}8}{108} = \underline{\underline{488}}$$

$\begin{array}{r}108\\35\\\hline 143\end{array}$ $$\frac{29400 \times 1{,}8}{143} = \underline{\underline{370}}$$

$\frac{108}{143} = 75{,}6\%$

---

ag_2SO_4 16730 — 16280

$\begin{array}{r}216\\32\\64\\\hline 312\end{array}$ $$\frac{1673 \times 1{,}8}{216} = \underline{1395}$$

$$\frac{1673 \times 1{,}8}{312} = \underline{\underline{962}}$$

$\frac{216}{312} = 69\%$ $$\frac{1628 \times 1{,}8}{\cancel{312}\ 216} = \underline{1358}$$

$$\frac{1628 \times 1{,}8}{312} = 940$$

---

ag_2CO_3 $$\frac{122900 \times 1{,}8}{216} = \underline{\underline{1020}}$$ $\begin{array}{r}216\\12\\48\\\hline 276\end{array}$

$\frac{216}{276} = 78{,}2\%$ $$\frac{1229 \times 1{,}8}{276} = \underline{800}$$

$agNO_3$ = 28700 — 23300 $\begin{array}{r}108\\14\\48\\\hline 170\end{array}$

$$\frac{287 \times 18}{108} = \underline{478}$$

$$\frac{287 \times 18}{170} = \underline{\underline{304}}$$

$\frac{108}{170} = 63{,}7\%$ $$\frac{233 \times 18}{108} = \underline{389}$$

$$\frac{233 \times 18}{170} = 247$$

$$\begin{array}{r} 223 \\ 93 \\ \hline 669 \\ 1997 \\ \hline 20739 \end{array}$$

$$\begin{array}{r} 652 \\ 305 \\ \hline 3260 \\ 2046 \\ \hline 20446 \end{array}$$

$$\begin{array}{r} 1055 \\ 76 \\ \hline 979 \end{array}$$

$Ag_2, O, N_2O_5\,aq$ – $\frac{16800 \times 1{,}8}{216} = \underline{\underline{140}}$

$Ag_2, O, SO_3\,aq$ – $\frac{20400 \times 1{,}8}{216} = \underline{\underline{169}}$

PbO $\frac{50300 \times 1{,}8}{207} = \underline{\underline{437}}$

$\frac{207}{223} = 93\%$ $\frac{50300 \times 1{,}8}{223} = \underline{\underline{406}}$

$PbCl_2$ $82800 - 76000$ $\begin{array}{r} 207 \\ 71 \\ \hline 278 \end{array}$

$\frac{82800 \times 1{,}8}{207} = \underline{\underline{719}}$

$\frac{82800 \times 1{,}8}{278} = \underline{\underline{536}}$

$\frac{207}{278} = 74{,}5\%$ $\frac{76000 \times 1{,}8}{207} = \underline{\underline{660}}$

$\frac{76000 \times 1{,}8}{278} = \underline{\underline{490}}$

$PbSO_4$ – $\frac{216200 \times 1{,}8}{207} = \underline{\underline{1880}}$ $\begin{array}{r} 207 \\ 32 \\ 64 \\ \hline 303 \end{array}$

$\frac{207}{303} = 68{,}2\%$ $\frac{2162 \times 1{,}8}{303} = \underline{\underline{1280}}$

$Pb(NO_3)_2$ = $105500 - 97900$ $\begin{array}{r} 62 \\ 2 \\ \hline 124 \\ 207 \\ \hline 331 \end{array}$

$\frac{105500 \times 1{,}8}{207} = \underline{\underline{917}}$

$\frac{105500 \times 1{,}8}{331} = \underline{\underline{572}}$

$\frac{207}{331} = 62{,}6\%$ $\frac{97900 \times 1{,}8}{207} = \underline{\underline{852}}$

$\frac{97800 \times 1{,}8}{331} = \underline{\underline{532}}$

157

1181

508

118) 11544 [illegible]

118 | 1457 [illegible]

$PbCO_3 = \frac{72900 \times 1.8}{207} = \underline{632}$ $\quad \begin{array}{r} 207 \\ 12 \\ 48 \\ \hline 267 \end{array}$

$\frac{207}{267} = 77.5\%$ $\quad \frac{729 \times 1.8}{267} = \underline{490}$

$Pb, O, SO_3\ aq$ - $\frac{73800 \times 1.8}{207} = \underline{640}$

$\frac{73800 \times 1.8}{303} = \underline{438}$

$Pb, O, N_2O_5\ aq$ $\quad \frac{68100 \times 1.8}{207} = \underline{591}$

$\frac{68100 \times 1.8}{331} = \underline{370}$

$Sn(OH)_2$ - $\frac{1365^{00} \times 1.8}{118} = \underline{2090}$ $\quad \begin{array}{r} 118 \\ 34 \\ \hline 152 \end{array}$

$\frac{118}{152} = 77.7\%$ $\quad \frac{1365 \times 18}{152} = \underline{1620}$

$Sn\,Cl_2$ — $80800 - 81100$ $\quad \begin{array}{r} 118 \\ 71 \\ \hline 189 \end{array}$

$\frac{80800 \times 1.8}{118} = \underline{1230}$

$\frac{80800 \times 1.8}{189} = \underline{769}$

$\frac{118}{189} =$ $\quad \frac{81100 \times 1.8}{118} = \overset{1240}{\cancel{1160}}$

$\frac{81100 \times 1.8}{189} = \underline{772}$

1273
249
1572

877

197 [illegible]

65

[illegible]

$SnCl_4$ 127300 157200

35.4
141.6
118
260

$\frac{127300 \times 1.8}{118} = 1940$

$\frac{127300 \times 1.8}{260} = 880$

$\frac{118}{260} = 45.7\%$ $\frac{1572 \times 1.8}{118} = 2400$

$\frac{1572 \times 1.8}{260} = 10.82$

$Au(OH)_3 = \frac{96000 \times 1.8}{197} = 877$

197
51
248

$\frac{197}{248} = 78.1\%$ $\frac{96000 \times 1.8}{248} = 693$

Au_2O_3 aq $\frac{-13200 \times 1.8}{\cancel{197}\ 393} = -60.8$

$\frac{393}{441} = 89\%$ $\frac{-13200 \times 1.8}{441} = -53.8$

$AuCl_3$ 22800 – 27300

35.4
3
106.2

$\frac{22800 \times 1.8}{197} = 208$

197
106
303

$\frac{22800 \times 1.8}{303} = 135$

$\frac{27300 \times 1.8}{197} = 250$

$\frac{197}{303} = 65\%$ $\frac{27300 \times 1.8}{303} = 162$

$AuCl$ $\frac{5800 \times 1.8}{197} = 54$

197
35
232

$\frac{5800 \times 1.8}{232} = 46$

$\frac{197}{232} = 84.8\%$

7-28-99

To break $CuNO_{3_2}$

$Cu(NO_3)_2$ (445.) + H_2O = $2HNO_3$ + Cu + O

82300
68300
140600
[illegible]

+ 68300 = 49100
$\times 2$
98200

140500 ~~[illegible]~~
98200
52400

~~$2HNO_3$ + Cu~~

Cu, O, N_2O_5aq − 52410

$\frac{52300}{46400}$ = 1,13 Volt.

$CuSO_4 + H_2O = H_2SO_4 + Cu + O$

198400 + 68300 = 210900 + 55800

198400
266700
210900
55800

$\frac{558}{464}$ = 1,22 Volt.

$CuCl_2$ = Cu + 2Cl —
62700

~~4-5~~
5-4

7-28-99

Iron deposit — on Ni —
Solution worked
continually about 5 hrs —
Deposit/for about 1-45 hr.

$FeSO_4$ NH_4Cl —
Dark deposit — rather bright
apparently very thin —

$FeSO_4$ Ammo Oxalate —
Bright, light-colored deposit —
better than above —

$FeSO_4$, NH_4SO_4
Appears like the oxalate
but not so thick —

NH_4Cl dark deposit —
rather bright apparently
thin perhaps best of
the lot

precip + dissolve Cl —
perhaps best all are
thin —

To reduce 25% NaOH
Sol to 20% —
Sp gr of 25% with Zn 1,40
Wt of 100 cc 25% = 128 gr —
" " NaOH in 100 cc = 32 gr —
" " H_2O in 25% = 96 gr —
" " H_2O in 20% = 128 gr —
Add 32 cc of 32 cc. H_2O to
100 cc Sol —

132) 320 (2.42
264
560
528
320

2.42
.2
48.4

200
48.4
151.6

Sp gr sol. with Zn 1.32

To make 175 c.c —

242
175
1210
1694
242
42350

42.3 H_2O
132.7 Sol —

7-29-99.

Determination of Zn in reg. sol—

20 c.c. strong sol—
15 c.c H_2O—
Slight precip. not enough to decant - Total wt 12.935
Weight of Ni, elect. 10.8425
2.093

Current .19 amp — 12 N.
Add 7 gr NaOH at 1-45
Separation not complete
20 cc. of 25% sol = $\frac{1.25 \times \cancel{20}^{5}}{4}$ = 6.4 gr NaOH

~~5 c.c. strong sol—~~
~~add H_2SO_4 to redissolve—~~
~~Weight elect. 14.922~~
~~New trial 10.841~~

8-3-99

KOH sol in R cell – 700 gr.
20% by weight – S. gr. 1140 = 16%

2-30 P.M. —	3.8 amp
2-40	4.4
3-20	5.4
5-0	5.7
9	5.7
8 AM. 8-4-99	4.5
10	3.0
11-30	0

8-5-99

Notice local action, make connection 2 P.M. – 6.5 Amp
dead in a few minutes

Transfer to new sol – 900 gr.
current start at 1 amp. 2-10 PM
evedently coating of Zn in CuO
2-15 – 2.7 Amp
3-15 – 5. amp
9-30 AM. 8-6-99 4.3 "
4-0 P.M. 3.8
5-0 3.8

8-2-99

Nickel in grids contains a large amount of iron —

Grids stuffed with ~~Ott~~ CuO — reduced, in 20% NaOH, and on oxydizing give off large amount of Zn. apparently from the scale! some Fe & Cu — Keep washing them to get all out, on second oxidization do not get as much as in first.

Nickle grid in 20% NaOH. give off Fe when oxidized coloring sol. pink —

8-4-99

Weight of Standard grid $\overset{14.87}{5.97}$ gr.
" of Scale 8.9 gr

Size of grid, 2¼ x ¾ x ⅛

Second 25% NaOH Sol
with Zn –
Sp. gr. approx 1.44 1/gr –
much heavier than 1st L

To reduce to sp. gr. 1.32

100 cc sol
145 / 45 cc
43.5
1.50
(31%

45 cc H_2O
175 " 175
31 = 54 cc H_2O
175
525
54.25
120 cc 2[illegible]

2''
7 25
= 67

Cement —

Oxychloride Magnesia —

Chloride sol — 1,26 sp gr —
28%

1st pat — Thick paste
2nd " Thin " 5 gr. 23 cc.
3 " Fluid —

4
5 } Dilute sol — with 25% the
6 vol. of water —

7
8 } Dilute original sol with 50%
9 Vol water if first addition is O.K. —

8 — 29 - 99 11-45

#1 A.

5 gr. MgO 11 cc $MgCl_2$ sol —
1.26 Sp gr — = 28% $MgCl_2$
67 Hrs set —
Mottled appearance quite hard to nail very smooth even under micro / part milk white & part translucent

66
42

#1B — Same 16 cc Sol —
Uniform in appearance. like
porcelain about same hardness
as #1. fracture like china —
67 hrs —

#2 23 cc sol —
shows free water on surface
may be a trifle softer than
#1 but equally good
appearance — Sticks to
saucer — 68 hrs —

#3 30 cc sol —
Free H_2O, good appearance
a little soft —
68 hrs —

#4. 15 cc [original sol
diluted with 25% H_2O] —
Soft. good appearance
68 hrs —

#4a 15 cc as above,
42 hrs old, ground in mortar
harder than #4 nearly as
hard as #1 — mottled appearance
and one or two bubbles —

#5 Mottled, quite hard
but not like 4a —
42 hrs —

#6 rather soft — not so
smooth as some —
stuck very tight to saucer —
42 hrs

#7 cracked in drying
rather soft — bubbles —
42 hrs —

#8 cracked drying, shrunk
very soft — poor surface —

#9 soft, ~~on~~ surface not
bright glaze — but good

#2 & 3 threw out water
#1 - 4a - 6 - & 9 seem best
2 - 3 very good except
for water —

Sp Gr of 20% weight Soda
1,220 = 18,58% NaOH

Sp Gr 30% Potash
1,212 = 23% KOH

Potash cell 645 gr Zn
Cell exhausted 388 " "
~~8 00~~ gr weight KOH.
1030 1,214 sp gr = 23%
2400 cc H_2O
645 Sp gr with Zn 1,310
388
257 gr of Zn in

All these soften in water, the hardest can be marked with finger nail

Water in KOH sticks —

2400 gr water
1030 " sticks
3430

3430
.23
1029
686
788,9 gr KOH

1030) 789 (.766 % KOH —
721
680
618
620

To make 180 cc 35% sol —
sp gr = 1,349

1,35
1,80
1080
135
243,0 gr —

2430
.35
1215
729
850,5 gr KOH —

7.66) 8505 (112 gr sticks —
760
905
766
1390

112
85
27

243
85
158 gr water
27
131 cc H_2O

Sp gr sol with Zn 1,490

Wt Zn 56 gr —
24.8
31.2

59
55.9
3.1 probably this much drops off

31 gr Zn to 112 gr sticks —
same relative amount as in 23% sol

10 - 20
1 - 40
5 - 05
2 - 55
2 - 45
10 - 140 = 12 - 20

55
3 - 45
3 - 15
10
17

12.55
.35
6165
3699
4.3155

3 - 20
3 - 25

3 - 20
4
7.33
.35
3665
2199

675
35
3375
2025
2.36

2.71

35
11
2.45
5.95

355
175
1.8

5 - 40
5 + 150
20
9.25

Life of Grid

commercial scale washed .35 Amp
Bubbler on first reduction 4.32 Amp. hr
#1 oxidized 2.36 Amp. hr
#2 " 3.18 " "
3 " 3.35 " "
3 " 2.36 42,36 1.81
1 2.36
2 " 2.71 42,77 1.81

Solid Grid

Weight 12.55
Mean of 3 grids, 7.7 Amp. hr.
#1 oxidized 2.56 Amp hr
2 " 2.91 " "
#3 " 4.22 " "
#1 1.92 amp/gm 3.44
#2 3.40 "
#3 4.05 " "
1 3.23 - 3.24
2 3.50 3.59
3 5.95 Amp hr
Elect. plated 3.86
New grid 3.94

#1
12.45
12.00
.45

#3
13.59
13.2
.39

~~11.57~~
10.65
10.40
.25

15.75
14.7
1.05

13.56
13.26
.30

11.67
13.25

14.55
14.13
.42

5 7.2

66

#1. NaOH sol #2 KOH sol #3 Al NaOH

Start plating at 5 P.M. 9-12-99

.118 Amp — 40H [illegible] [illegible] —

gas at start —

Nickle plated grids platinum

Current off 8 P.M. Na grids black & good deposit on water line. specific weight of deposit #1 - .45 #2 - .39

local action strongest on #2 —

Current on 8-25. .112 Amp —

Dissolve #1 & 3 in HCl —

Current off 11-25 .11 Amp

#1 & 3 O.K. #2 slight black fringe on water line O.K. —

Gain on #1 .25

Current on 8-20 9-13-99 .12 Amp

Local action strong on #3

9-45 Edison dosed #1 with Phosphide + [illegible] #3 with H_2S + [illegible] — new grids —

All off 12-10 .11 Amp —

Gain on #2 1.05 gr. —

on 1-30

New grid #3 3-40 Gain = .42

" " #1 4-0 " = 1.30

off 5-3

112
24
448
224
158) 2688 (17 cc
158
1108
1106
250

112 × 890
2400
1030

890 cc H_2O

297

2436
[illegible]

107) 2156 ([illegible]

~~112/158 × 2400 = 17 cc~~

~~• 120 gr [illegible] × 2400 gr [illegible]~~

Current for [illegible] —

1 amp hr = .0374 gr H
= .0374 × 8 = .2992 gr O
= .299 × 4 = 1.196 gr Cu
= .299 × 5 = 1.495 gr CuO —

KOH cell with Tannate Al.
on .11 amp 1-35 9-13-99
off 8+25 P.M. good deposit except for hard black lumps, not better than first from plain KOH gain
on 8-30 AM 9-14-99 .20 Amp
off 12 same as first
wt 12.90 1-35 .192

90 cc NaOH 20% ZnO sat —
35 " " —
55 H_2O —

Zn — 13.61 – 13.88 .27
On 2-35 9-13-99 —
Off 8-20 medium good .14 Amp
Gain .27
On 8-30 AM 9-14-99 .18 Amp
off 12 poor —
wt 13.14 1-30 .197

90cc KOH ZnO
90 cc $NaOH$ ZnO
14.03 Zn — 14.66 – .63
3 - P.M. 9-13-99
off 8-15 .11 Amp. little ~~no~~ better
than plain soda — Gain .63
On 8-30 AM 9-14-99 .18 Amp
off 12 very fair
wt 13.45 1-35 .197

Continued from pp 48
#1 off. 8-35 PM bad —
#2 off " 8-35 more lump —
than at first good deposit.
#3 off 8-40 P.M —
#3 on 8-25 A.M. 9-14-99 [illegible]
#2 " 8-25 120 Amp
#1 " "
#1 off 12 bad
#2 off " "
#3 " " "
#1 & 3 thrown out
#2 cut 13,17 on 1-35 [illegible]

1225
18
9800
1225
22050

441
23
1323
882
10143
4)10143
2536

Pure NaOH —

Amount of Na for 180 cc 20%
NaOH sol. — Sp. Gr. = 1.225
Total wt. = 180 × 1,225 = 220.5 gr.
220,5 × .20 = 44.1 gr NaOH.
$NaOH = 23 + 16 + 1 = 40$ —
Wt Na = $\frac{23}{40} \times 44.1 = 25,36$ gr. Na —

Cells #1 & 1a.

~~Cu O plates, #1 = 12.5 gr #2 = 14.0~~

Cell #1 6% ~~NaOH~~ KOH, purified by current, amalgam Zn. No plate. Start at 11 AM. 9-21-99 sp. 1.20 After Zn begins to gas at 11 AM. continuous gas on plate. Zn covered with black deposit. HgO?. Clean this off twice. 2.30 white ZnO appears & sol. turbid at bottom.

Cell #1a 180 cc KOH. sp. gr. 1.247 purified by current. plates from #1 to be placed in this for local action.

Cell #2 —

Mode of working — Keep 1 amp. hr. heavily amalg. on plate, charge + dis. in KOH sol. — sol. is 35% sat. by Zn with ordinary grids —

1 amp hr in land amalg. .80 amp hr charge and begins to come bad (plat. wire) put in grid that has been worked and disc .80 does not show much Hy. we reamalg. take out grid and charge from wire. 1.50 amp h. —

Begin dis. 11-5 A.M. 9-21-99 .40 amp 1.41 of
" charge 3-30 P.M. .32 amp — 1.40 "
" disc 9 " .60 "
" charg 11-30 .12 " 1.36
" disc 9-45 A.M. 9-22-99 — .35 amp
" charge 1-35 P.M. 1.02 amp hr
" disc 8-35 — .34

Off see pp 62 —

Cell #5. —

23% KOH by current
Ni plated grid with Electro Cu-
scale. ~~Let ramp~~ Anal of Zn—
Let 1 amp be run, clean
& reanaly. Zn — After
grid is reduced give .16 amp
and let run at that —
12-15 P.M — 9-21-99 3 amp h—

1.96
18
8

8/1.96
.245 gr H =

8 per O = 1:1

.0374 | 2450
2244
2060 | 6.5

5/13.46
2.69

2.69
8 X .0374 =

.9031
.5729
4760

4298
4760
19538 - 8.99

Lake superior scale

Weight of grid #1 4.45 - 4.50
" " " loaded 17.91 15.65
" " scale 13.46 gr 11.85
Reduced : 5.42 Amp. hr.
Reduced copper 14 - 2.50 = 11.50
13.46 - 11.50 = 1.96 gr O = .245 gr H = 6.5 Amp.
note partially oxidized and again reduced may have made the reduction more perfect.
Theoretical O 2.69 gr —
" Amp hr. 8.99

Weight Grid #2 5.92 - 5.98
" " loaded 16.89 16.50
" scale 10.97 10.52
Reduced 4.72 Amp. hr. [calls for 7.33 Amp. [illegible]

6.205
5.701
.504
1.110
.625

Lake sup. scale —

.7357 mg scale —
dis in H NO3 leave little sand —
get .625 mg. cu — theoretical =
.588 mg
lost a little cu and a little
may be oxidyzed ; seems —
to show excess cu which
there is, not much good —

Baking grids

Silver lake wet — $Cu(NO_3)_2$ —
" " dry "
" " " Cu acetate —
" " wet grape sugar —

2-15
~~10-2-99 7-35 P.M.~~ ~~10-3-99 8-0 A.M.~~
~~10-11-99 8-15 AM~~ ~~10-13-99 10-30 A.M.~~
~~10-16-99 9-20 AM~~ 10-19-99 11 AM.

11-15
~~10-2-99 9-10 P.M.~~ ~~10-4-99 9-25 A.M.~~
~~10-5-99 10-0 P.M.~~ ~~10-9-99 8-35 A.M.~~
~~10-11-99 8-15 AM~~ ~~10-13-99 8-30 AM.~~
~~10-17-99 8-45 AM~~ 10-19-99 9-40 AM.

11-45
~~10-2-99 9 A.M. 7-40 P.M.~~ ~~10-3-99 4-10 P.M.~~
11-30 2-17
~~10-4-99 4-30 P.M.~~ ~~10-5-99 7-50 P.M.~~
~~10-6-99 8-0 P.M.~~ ~~10-9-99 5 P.M.~~
~~10-11-99 8-15 AM~~ 10-12-99 8-15 AM.
1-45
~~10-3-99 8-0 P.M.~~ ~~10-4-99 8-45 A.M.~~
~~10-5-99 10-5 P.M.~~ ~~10-8-99 6 P.M.~~
~~10-11-99 1-25 P.M.~~

4-30
~~10-3-99 8-30 A.M.~~ ~~10-4-99 8-45 A.M.~~
11
~~10-5-99 8-5 A.M.~~ 10-6-99 9-45 A.M.
~~10-9-99 1-45 PM~~ ~~10-10-99 8-40 P.M.~~
~~10-12-99 8-15~~

9-27-99.

#1 To be ox. on .25 Amp — grid with Superior scale. soaked in Cu acetate sol. + baked — Ox — 2 amp hr? — 1.2 — 1.3 — 4.5 — 4.9 — 4.5

#2 grid — Sup. scale — soak in $CuNO_3$ and bake. (about 1¼ Amp. hr. short of #4 in reduction —) ox — 2.75 Amp hr — 2.4 — 3.4 — 3.7 4.0 — 3.8 — 4.2 — 3.8 — 3.6

#3 pp 64 grid with Cu precip. by Zn from $CuSO_4$ Ox. 2 amp hr — 1¼ hr — 1.6 — 1.7 — 2.1 — 2.2 2.1 — 2.4 — 2.5 — 1.9

#4 pp 67 Wt grid — 5.77 wt plate — 14.53 plate ∴ has a large amt. metallic Cu. was prepared from precip Cu + grape sugar — Theo. 10 amp hr. 4.0 amp hr — 3.5 — 4.5 — 4.2 — 4.0 — 4.1

#5 pp 67 Wt grid 4.99 wt plate 13.25 Sat'd bake wet $CuNO_3$ — 3.5 amp hr — 3.0 — 1.7 — 3.2 — 2.1 — 2.8 — 2.5 3-2

9-45
~~10-3-99 8-25 A.M.~~
9-55
~~10-4-99 8-30 P.M.~~
~~10-6-99 10-30 A.M.~~
~~10-9-99 7-40 P.M.~~ —

14.34
1.59
12.75

8-30
~~10-2-99 9-15 P.M.~~ — ~~10-4-99 8-30 A.M.~~ —
7-25
~~10-4-99 10-10 P.M.~~ — ~~10-6-99 8-25 A.M.~~
~~10-7-99 4 P.M.~~ — ~~10-10-99 3-35 P.M.~~
24

3-0 10-30 22
~~10-2-99 8-0 P.M.~~ — ~~10-5-99 8-5 A.M.~~ —
~~10-8-99 5-35 [illegible]~~ ~~10-11-99 4-30 P.M.~~
~~10-16-99 8-30 A.M.~~ — ~~10-18-99 6 P.M.~~ 23.5
23/10 99 3.00 pm 5.7
2-30
10-2-99 7-40 P.M. — ~~10-5-99 8-15 A.M.~~
~~10-7-99 2-0 P.M.~~ — ~~10-11-99 7-30 A.M.~~
~~10-13-99 3-15~~ ~~10-17-99 8-40 A.M.~~ — 10-19-99 1-30 P.M. —
23/10 99. 9.3? am (clean)

clean

~~12-0~~ P.M.
~~10-2-99 9-10 P.M.~~ — 10-4-99 8-30 A.M. —
9-45
~~10-5-99 9-15 A.M.~~ — ~~10-6-99 4-30 P.M.~~
~~10-8-99 8-40 A.M.~~ — 10-11-99 9-50 A.M. —

pp 66 —
~~#9~~ grid — 4.92 plate 13.17
Silver ~~Sup~~ lake scale dry much CuNH₃ —
3,6 amp hr — 3,1 — 3.6 — 3,5 — 3,3

pp 66 —
~~#10~~ — grid 4.84 plate ~~14.34~~ ~~13.40~~ 12,75
Silver lake scale Cu acetate —
3.5 amp. hr — 3.0 — 1.9 — 2.5 — 3,2 — 2,7 — 2,4

#11 best old grid fine scale scale —
at .35 4 amp hr
at .25 — 6.0 — 5.7 — 6.4 — 6,0 — 6,2 — 5.6 — 5.6

#12 best old plate, silver lake surf — at 12.55
but used at .35 — 6 amp hr —
at .25 5.9 — 5,6 — 5.6 — 5,8 — 5,0 — 4.2 — 4.4
4.5 — 4.75 — 5.0 — 5.0 — 4.3 — 3. — 4.2 5.0 — 5.5

pp 67
~~#9~~ Grid electron scale —
3.6 amp hr — 2.5 — 2.9 — 3.4 — 3.3 — 2,9 — 3.4

3-15
10-3-99 ~~7-30 P.M.~~ —
2-45
~~10-4-99 8-55 P.M.~~ —
13-45
~~10-6-99 9-40 A.M.~~ —
~~10-7-99 3 P.M.~~ —

1-45
~~10-4-99 8-30 A.M.~~ — ~~1-5 P.M. 10-2-99~~ —
~~10-5-99 10-0 P.M.~~ — ~~[illegible]~~
~~10-11-99 10-20 AM~~ — 10-13-99 8-30 AM —

9-15 10-25
~~10-3-99 8-30 A.M.~~ — ~~10-4-99 9-35 P.M.~~ —
~~10-6-99 10-30 AM~~ — ~~10-9-99 8-35 A.M.~~
~~[illegible]~~ — 10-11-99 10-20 P.M. —

10-30
~~10-2-99 7-55 P.M.~~ ~~10-4-99 8-30 AM~~
10-40
~~10-5-99 9-20~~ AM — 10-11-99 4-30 P.M.
~~10-6-99 9-45 AM~~
~~[illegible]~~ —

12-0
~~10-2-99 9-15 P.M.~~ — ~~10-3-99 9-25 P.M.~~ —
3 8-25
~~10-5-99 8-0 A.M.~~ — ~~10-6-99 8-25 AM~~
~~10-7-99 10 AM~~
10-10-99 8-35 A.M. —
~~10-3-99 11-15 A.M.~~ — ~~10-7-99 11-30 A.M.~~ —
4-0
~~10-4-99 8-30 P.M.~~ — ~~[illegible]~~
4-20
~~10-5-99 8-20 P.M.~~ —

9-28-99 —

see pp 65

#3 grid 5 gr - plate - 13.19
silver lake plate soaked in $CuNO_3$ + burned —
3.8 amp hr - 2.4 - 1.9 - 1.2 - 2.9 - 2.1
When taken out loose fit in grid —

pp 67.
#2 — 10.52 gr sup - scale, reduced & replacing ox — 4 1/8 amp hr — 3.6 - 4.5 - 4.2 - 4.1 - 4.2

pp 67
#4 grid 5.09 gr plate - 13.61 —
silver lake plate soaked in ~~acetate~~ burned —
3.4 - 3.4 - 3.9 - 3.5 - 3.4 - 3.1 - 2.6

pp 67
#5 grid & wire 5.82 scale 9.87
sup scale, fine Cu wire in grid —
2.4 amp hr - 2.4 - 3.0 - 2.80 - 3.4 - 3.3
3.5 —

pp 65 —
#6 grid 5.46 gr scale 12.64
reburned scale, fine powder —
1.3 - 1.4 - 1.5 - 2.4 - 2.4

pp 65
#7 grid gr plate 13.44 after dip 13.92
Silver lake plate dip 5 times in $NiNO_3$ + burn
3.4 - 2.4 - 2.5 - 2.0 - 2.0

10-30
~~10-3-99 8-20 AM~~ - ~~10-4-99 8-45 A.M~~ -
10.30
~~10-5-99 9-15 AM~~ - ~~10-6-99 9-45 AM~~ -
~~10-9-99 8-35 AM~~ - ~~10-10-99 8-40 AM~~ -
~~10-12-99 10-20 AM~~

4-30
~~10-4-99 8-55 P.M~~ - ~~10-10-99 10-20 AM~~ -

~~3-30~~ 10-11-99 8-15 AM
~~10-7-99 1-45 P.M~~ -
~~10-10-99 8-45 AM~~ - ? 5.2? ~~10-12-99 5-20 PM~~ -
~~[illegible] 8-15 AM~~ ~~10-12-99 8-30 AM~~ - 5 P.M

~~10-5-99 2-15 P.M~~ - ~~10-10-99 3 PM~~
~~10-11-99 8-15 AM~~. 10-11-99 10-20 P.M

~~10-10-99 8-35~~ ~~10-11-99 8-15 AM~~ -
~~10-12-99 8-45~~ ~~10-13-99 8-30 AM~~
~~10-14-99 9-10 AM~~ ~~10-[illegible]-99 8-45 AM~~
10-19-99 9-45 AM.

~~10-11-99 8-30 AM~~ ~~10-11-99 9-50 AM~~
~~10-12-99 4 PM~~

---

pp 67
~~8t~~ Lake wp. scale washed several times and repacked when oxidized -
2.0 - 2.9 - 2.8 - 3.8 - 3.6 - 3.6 - 3.4 -

pp 66 -
~~#18 Wt grid 6.17 fill with reduced ox. scale total wt. 14.69 or 2.4 amp hr~~
~~18~~ Wt grid 6.14 loaded -
Coarse melted scale 0.5 - 1.1 - 0.7
~~19~~ Wt of plate 14.84 gm -
Silver lake ox. cement with $NaNO_3$ solution - 5.2 - 5.2 - 4.0 - 2.8
#1

pp 66 -
~~20~~ About 12 gm Cu deposited and frequently washed and burned out
1.8 - 1.8 - 1.8 6 2.2 -

~~21~~ Wt plate 11.68
Silver lake ox Ni hydrate soln
small lump - 2.4 - 1.9 - 1.9 - 2.0 - 2.2 -
3.0
pp 67.
~~22~~ Wt plate 9.6 -
Mix 15 gm Silver lake OX - 7/2 $CuNO_3$
3.0 - 3.1 - 2.1 broke

8 ½ 7 1

~~10-10-99 8-35 AM~~ ~~10-11-99 8-45 AM~~
~~10-11-99 10-20 AM~~ ~~10-12-99 8-30 AM~~
~~10-12-99 8-50~~ ~~10-16-99 3-30 P.M~~ 1 P.M.
~~10-17-99 3-45 P.M.~~ ~~10-18-99 8-30 AM~~
~~10-12-99 1-5 P.M~~ ~~10-12-99~~ ~~8-15 AM~~ ~~10-20 A.M.~~
~~10-12-99 8-30 AM~~ ~~10-13-99 8-40 A.M~~ 18 ~~7-40~~
~~10-16-99 8-15 AM~~ ~~10-16-99 5-30 P.M~~ 4 P.M
~~10-17-99 8-45 AM~~ ~~10-17-99 8 P.M.~~
~~10-17-99 8-15 A.M~~ ~~10-12-99 8 P.M~~
~~10-16-99 8-15 AM~~ 10-18-99 8-30AM -

~~10-11-99 8-20 AM~~ ~~10-13-99 8-30 AM~~
~~10-16-99 10-40 P.M~~ 10-19-99 2 P.M.

V.C.I
~~9-45 P.M. 10-12-99~~ ~~10-12-99 1-25 P.M~~
~~10-13-99 8-30 AM~~ ~~10-10-99 8-20 AM~~
~~10-17-99 1-20 P.M~~ 10-18-99 11 AM.

~~10-10-99 8-35 P.M~~ ~~10-12-99 8-15~~ AM
~~10-13-99 10-10 A.M~~ ~~10-16-99 10-45 P.M~~
~~10-19-99~~ 11 AM ~~23/10 99 9.30 am~~ | 23/10 8.30 am

Thin crystal lake plates are
27% Vanadium —

~~23~~ Wt plate A 10.4 gr —
Melted scale and under 200 —
2.4 — 1.8 — 1.9 — 2.2 — 1.6 — 1.2 — 1.6 — 1.1 —

#1. Directly Cu analy. press burn in muffle — 1.1 — 1.5 — 2.0 — 1.7 — 1.2
.9 — 1.1 — 1.3 — 1.8 — 1.7 —

#29 Wt plate 11.4 Silver lake ox
18 gr grape sug. 2 gr.
3.5 — 3.9 — 4.5 — 4.4 —

#13 Wt plate 12.1 Silver lake ox
20 gr 2 gr licorice —
3.8 — 4.5 — 4.1

#~~4~~ Wt plate 11.3 ordinary plate
reduced replaced in press and welded
3.6 — 2.9 — 3.0 — 3.4 —

#~~16~~ Reduced plate scaled in CuSO4 + plated in 3 Times
3.5 — 4.2 — 4.1 — 1.6 — 3.0 — 2.0 — 1

~~10-11-99 9-35 AM~~ ~~10-12-99 9-40 AM~~
~~10-12-99 8-55 AM~~ ~~10-17-99 5-15 PM~~
10-19-99 2 P.M.
~~10-11-99 8-59 A.M.~~ ~~10-12-99 8-45 AM~~
~~10-13-99 10-10 AM~~ ~~10-16-99 8-30 AM~~
~~10-17-99 10-30~~ 10-19-99 8-40 AM

~~10-13-99 8-30 AM~~ ~~10-13-99 8-45 P.M.~~
~~10-17-99 4-40 PM~~ Run 6h 30m by R.
5/10 10.30 am light [illegible]
~~10-11-99 1-40 P.M.~~ ~~10-12-99 8-15 AM~~
~~10-13-99 8-30 AM~~ ~~10-14-99 9 AM~~
~~10-16-99 7-30 AM~~ ~~10-17-99 6 P.M.~~ ~~10-19-99 [illegible] P.M.~~

~~10-13-99 10-45 AM~~ ~~10-17-99 8-45 AM~~
10-18-99 7-35 PM

~~[illegible] 99 8-25 AM~~

~~10-12-99 3-30 PM~~ ~~10-13-99 10 AM~~
10-13-99 ~~2 PM~~ ~~5-20 P.M.~~ ~~10-14-99 10-50 AM~~
~~10-16-99 11-20 AM 2-40 PM 10-16-99 7-30 P.M.~~
~~10-17-99 8-45 AM~~ ~~10-17-99 1-25 PM~~ 4 P.M.
~~8-30 AM~~ 2 P.M. ~~2-30~~ 1-30

#4 Analy by elect. [illegible] in H.
3.5 - 3.6 - 4.0 - 3.4

#~~2~~5 Wt 10.4 gr. ordinary grid reduce, analy & heat in H - 2.0 - 2.4
2.8 - 2.8 - 3.0 -

#10 Silver flake ox with coal ~~tar~~ -
3.6 - 4.7 - 4.5 - - 4.5 - 4.1

#~~2~~6 Wt plate 9.4 Cu precip by Zn analy harden [illegible], & heat in H -
1.7 - 1.8 - 1.7 - 1.6 - 1.7 - 1.4 - 1.9 -

#~~15~~ Common plate soake in sugar sol & burn twice soak again & work -
4.5 - 3.4 - 3.4

~~#0 Common plate reduce [illegible] in H~~

#20 Precip Cu analy mould allow to harden & heat in H.
.2 - .4 - .3 - .4 - .5 - .2 - .2 - .3 - .2 - .1

~~10-12-99 4-30 P.M. 10-14-99 8-30 AM~~ -
~~10-17-99 10-40 A.M.~~ - ~~10-18-99 11 AM~~ - 10-19-99 6 P.M.

~~10-13-99 11-50 AM 10-16-99 8-25 AM~~
~~10-17-99 11 40 A.M.~~ - ~~10-19-99 8-40 A.M.~~ 23/10-99 9.3[illegible]
rather clear

~~10-13-99 9-30~~ A.M. ~~1-15 P.M.~~ - ~~9-30 10-16-99 [illegible]~~
~~10-17-99 11-20 AM. 10-17-99 8-45 AM.~~
~~10-17-99 2-15 P.M.~~ - #8 8-30 AM #8 2-15 #8 7-30
~~10-13-99 10-20 AM - 7-30 P.M. - 10-16-99 10-55~~
~~10-16-99 2-40 P.M. - 10-16-99 10-40 P.M.~~

~~10-13-99 11-15 A.M. - 10-16-99 7-35 P.M.~~ -
~~10-15-99 11 AM~~ - 10-19-99 7-30 P.M.

~~10-13-99 2-30 P.M. - 7-35 P.M. - 10-16-99 8-30 A.M.~~
~~10-16-99 9-50 P.M.~~ - 17 ~~4-45~~ ~~10-18-99 8-50 AM~~
~~10-19-99 11 AM~~. 10-19-99 8-30 P.M. -
~~10-14-99 10-10 AM 7 P.M.~~ 10-19-99 2 P.M.
7h. by R. | 24/10. 2.45 pm. not clear

~~10-13-99 5 P.M. 10-17-99 10-40 AM~~. 10-19-99 1 P.M.

#2 precip Cu, amalg. harden, reamalg. - harden burn in H -
2.7 - 2.8 - 2.5 - 2.8

#8 ok Grid reduced + amalg. -
2.6 - 2.9 - 3.0 - 4.0 - 3.9 - 3.5 - 4.0

#3 Electr amalgam -
.2 - .1 - ~~1~~

#14 Wt Cu tinsel 6.24 in grid:
.2 - .4 - 1.2 - .4 - 1.0

#15 Transfer to NaOH sol. see pp 63
.2 - 3.2 - 2.8 -

#11 Tinsel soaked in Cu $(NO_3)_2$ + burned / 20%
.4 - 1.1 - 1.1 - 1.1 - 1.3 - 1.1 - 1.2 -

#1 Reduced plate acted on by $AgNO_3$
2.6 - 3.4 - 3.8 - 4.3 - 3.0 - 4.1
4.0 - 3.2 - 3.4.

2x. Old #7 plate KOH with K_2SO_4
3.9 - 3.9

~~10-16-99 9.5AM~~ clear
10-18-99 8:30AM (6h 30m by R) 24/10 10.30 am

~~10-16-99 9.15AM~~ / ~~23/10 99 9 a.m.~~ 24/10 900 am
~~10-18-99 8.30AM~~ / Clear
10-19-99 11AM (7h by R) 24/10 10.00 a.m.
~~10-16-99 9.30AM~~ ~~10-17-99 8PM~~ very clear
10-19-99 7-30PM ~~1am~~ 1 hour by R
24/10 8.30 a.m

~~10-16-99 9.30AM~~ ~~10-16-99 9.30AM~~
~~10-18-99 8.30AM~~ 10-19-99 1PM
not very clear
~~10-16-99 9.45AM~~ (dark blue)
~~10-18-99 8.30AM~~ (Run 13h 30 by R)

~~10-16-99 1.35PM~~ [24/10 8.30am (clear)
~~10-18-99 8.30AM~~
10-19-99 7.30PM 1 hour by R.
10-17-99 8PM 9h 30m by R Blue

23/10 99. ~~9 am~~ very clear

~~#27~~ Silver lake ex, thru 200 mesh
4.4 - 3.9 - 4.1 - 4.2 4.2 - 5.5 - 5.0
4.5

~~#28~~ Silver lake ex with charcoal
3.0 - 1.5 - - 2.0 - 3.5 - 2.1

~~#29~~ Silver lake ex. with graphite
3.4 - 3.0 - - 2.75 - 3.5 - 2.75 - 3.3

~~#30~~ Silver lake ex. ZnO
2.5 - 1.5 - 2.0 - 1.6

~~#31~~ General mixture
4.1 - 4.7 - - 4.9 - 4.5 - 4.3

~~#32~~ Lake surf scale & Tar
3.5 - 3.2 - 4.0 - 3.9 -

#6 Ordinary grid
5.1 - 6.1 - 5.0 - 5.5 - 5.5 - 5.0

~~#4~~ Wt of plate 13.4 gr. AgNO3 14 gr. CuO 40
cement with soda
3.5 - 3.2 - 2.9

23/10 99 9.30 am (clear)

~~9.30 am~~ (clear)

23/10 99 ~~9.30 am.~~ rather clear

23/10 99. ~~1100 am.~~ mud on the platinum

~~23/10~~ 99. ~~9.30 am.~~ clear

~~23/10 9.30 am~~ dark blue when charged

2/ ~~9.30 am~~ dark blue when charged

23/10 ~~9.30 am~~ light blue w. chgd

23/10 ~~9.30 am~~ light blue not chgd

#5 Valentiner much 14.5 gr.
5.0 - 4.5 - 5.1 - 4.8 - 4.8. 4.8 - 4.0

#19 12.9 gr. Ox. from $CuNO_3$
3.25 - 3 - 2.75

#21 12.3 gr. 3/4 sticks potash & 40 gr. -
3.0 - 1.5 - 1.75

#23 17.6 gr. Litharge 15 gr Ox 40 gr soda —
3.75 - 2.6 - 3.3 - 3.6 3.1

#X. Glucose
3.5 - 3.1 - 3.5. 3.9

#7 Wt 12.6 Bi sub nit 6 gr Ox, 40 gr soda.
3.1 - 1.9 - 1.9

#9 Wt 13.6 Bi sub nit 6 gr Ox 40 gr $CuNO_3$
4.5 - 2.25 - 2.8 - 2.2

#25 Wt 15 gr. Stannous ox 6 gr Ox 40 soda.
3.5 - 3 - 2.5

#26 Wt 14 gr Stannous ox 6 gr Ox 40 $CuNO_3$
3.6 - 3.4 - 3.25 - 3.7 - 4.8. 3.6 4.1 3.9

23/10 99 ~~9.30 am~~
rather clear

~~23/10 99~~ ~~9.30 am~~ 24/10 10.30 am

23/10 99 ~~9.30 am~~
yellow & red vol. changed

23/10 99 ~~9.30 am~~
very unclean

23/10 99 9.30 am 24/10 10.30 am
rather clear

23/10 99 ~~9.30 am~~ ~~24/10 8.30 am~~
clean

23/10 99 ~~9.30 am~~ dark violet

~~23/10 99 9.30 am~~ 24/10 3.30 am rather clear

23/10 99 ~~9.30 am~~ rather clear

#18 11.8 gr 4 gr Borax 40 ox. CuNO₃ — very hard plate
8.5 - 3.75 - 3.1 - 2.8 - 3.3

#20 MnO 6 gr 40 ox. soda — 9.8 gr
3.25 - 1.9 - 1.8 - 1.9

#24 MnO 6 gr Ox 40 gr CuNO₃ — 13.8 gr
8.75 5.25 = 4.0 - 3.8 - 3.3

#32 MnO 6 gr Ox 40 g NiNO₃ —
3.25 - 3.6 - 3.1 - 2.9

#17 Oxide from hydrate - 13.2 gr
2.4 - 1.9 - 2.5

#15 Cement with FeCl₃ - 8.4 ~~[illegible]~~ gr
1.37 - 1.25 - 1.5 - 1.5

#22 Cement with MnNO₃
4.6 - 5.4 - 5.3 - 5.3 - 5.8 - 5.0 - 5.0

#30 15.2 gr Cement with Amt. Cl. about ½ grnd
1.6 ± 1.5 1.5

#13 12.9 gr Cement with lithia hyd
3.6 - 3.25 - 3.4 - 3.0 - 3.6 - 5.0

23/10 97. ~~9. same~~

very little blue

4 1175 gr Lith Carbonate with soda
3.6 - 3.5 - 3.5 - 2.8 - 3.0

3 $AgNO_3$ 10g. Silv Cake 40g. [illegible] soda
3,1, - 2.7 - 2.5 - 2.6

20 Valentiner mick
3.8 - 3.8 - 3.5 - 3.5 - 3.9

30 Litharge 15g, soda, Silv [illegible] 40g
3.7 2.1 2.0

a ~~21~~. 12.4g (17.15 w. frame)
Bi sub nitr. 6g Silv. lb. 40g soda
2.9 - 2.9

~~7~~. 13.1g (w. frame 18.3
Bi sub nitr. 6g. Silv. lb. soda
4.1 - 3.6 - 3.5 - 3.5 - 3.5 - 3.7 - 3.3 - 3.5

~~7~~ 13.62. (w frame 18.99)
Stann ox 6g Silv lb. 40. soda.
3.0 - 2.8 - 2.4 - 2.5 - 2.1 - 2.0

~~6~~ 13.1g Glucose
4.0 - 2.5 - 3.3 - 2.5 - 2.0

28 (11.45g)
(8) Borax 4g Lith 40g soda
2.4 - 1.9

~~32~~ 13.0g (13.50g)
(8) Borax 4g Lith 40g $CuNO_3$
2.9 -

10 13.18 g
(16) MnO 6g Lith. 40 soda
1.5 - 1.5 - 2.0

25 8.7 g
(9) Cement with $FeCl_3$
1.3

~~11~~ 13.62 g

MnO 6 [illegible] Co. $CuNO_3$

2.1 – 2.3 – 2.6)

~~12~~ 14.7

Cement with $NiNO_3$.

3.3 – 4.0 4.0 4.0.

wash liquid

5.0

~~12.8 Cement with $SnCl$~~

~~9~~ 11.4 g

25) Lith. Carb. w. soda

2.2

# ~~32~~ 11.2g
CuO with coal tar
3.5 - 3.0 - 2.5 - 3.3 - 3.2 - 2.9

# ~~3~~ 12.6g ? 14.6g
Fe_2O_3 made from acetate of [illegible]
like much (3.3g)
5.5 - 5.3 - 6.2 - 6.67 - 5.2 5.5

~~#28~~ 11g Oxyde [illegible]
1/2 Cyanide of Copper 37.7 g, [illegible]
20 – 2.8 – 2.7 – 2.

~~#25~~ 14g
Partially oxydized precipitated Cu
in Cu_2O
3.3 – 3.3 – 3.3 –

~~#18~~ 12.95g
Precipitated Copper w. Sugarsolution
12 3.3 3.5 – 4.0 – 3.3 – 4.5

Clear

~~4~~ (13.15g)
Precipitated Copper w. Silv acetat in Amm
3.5 - 3.0 - 2.8 - 2.8 - 2.0 - 1.5

~~9~~ (14.05)
Precipitated Copper with Ball. mill
3.4 - 4.1 - 3.5 - 3.2 - 3.2 - 3.8 - 4.0

~~24~~ (15.05)
Precipitated Copper w. CuO in Amm.
4.4 - 4.2 - 3.9 - 4.2 - 4.5

Muck A.

Rosen	100	42.5%
Water	125	53.25%
Soda hyd.	10.	4.25%

Soda solved 1:2 in Water

Muck B

Rosen	100
Water	125
Soda hyd.	10
Residium ore	35.

#34 (13.05 g)
40 g CuO, 3 g Muck A
3.0 – 2.5 – 2.5 – 3.3 – 2.9 – 3.2 – 2.0

~~30~~ (13.40)
40 g CuO, 3 g Muck B
3.6 – 3.1 – 3.5 – 1.8 – 3.2 – 4.1 – 4.1

#10 (13.17)
40 g CuO 4 g Muck A
3.3 – 3.0 3.8 – 3.1 – 4.0 – 3.0 – 3.1.

4 ~~28~~ (13.57)
40g CuO ; 2g Unick A.
4.2 - 1.8 - 3.6 - 2.8 - 3.9 3.1 - 3.5

#X (14.75)
40g CuO ; 3g Unick A
dipped in $AgNO_3$ and washed
4.4 5.8 - 6.2 - 5.6 - 5.0

15 (12.43)
40g CuO ; 3g Unick A.
2.8 - 2.8

~~31~~. (12.65)
40g CuO 3g Muck A
3.3 - 3.0 - 2.8 - 3.9 - 2.8 - 3.1 - 2.4
3.1 - 3.3 —

~~33~~ 14.3g
40g CuO ; 3g Muck A
Dipped in KCN and rebaked.
4.3 - 4.

32 (14.9)
CuO 40g. 3g Muck A
Dipped in $\overset{5}{Cu}(C_2H_4O_2)_2$ and rebaked
repeated twice
4.3 - 3.9 - 3.2 - 4.1 - 4.5 -

2 10.85
upper [illegible] [illegible] hotel
3.3 – 3.5 – 2.3

7 (4.4)
[illegible] with [illegible]
40 – 3.5 – 3.9 – 3.2 – 3.1

3 12.95
[illegible] with Petch [illegible] – Berg
3.5 – 3.0 – 3.0. 2.5 – 3.9

Muck C.

Rosen	40 %
Water	50 %
Soda	10 %

dark blue

11.7 g

~~X~~ CuO. 40g Roll muck A 3g
Slope t[illegible] containing ca 15
stripes [illegible] × 20/1000

3.7 - 3.9 - 3.0 - 3.8.

~~X~~. 40g CuO. 3g Muck C.
pressed at 150 [illegible]
([illegible] 350 atm) 14.20 g
3.9 - 4.1 - 4.1 - 4.0

15 CuO from CuSO4. 12.5
3.8 - 3.2 - 3.5 - 3.2 - 3.4 - 3.5 - 3.0 - 3.0

Munch D

Rosin	47.5%
Water	50%
Soda	2.5%

Dark blue

# ~~16~~ 40 g CuO 3 g Munch C
pressed 375 atm 13.9 g.
4.1 - 3.2 - 4.3

# ~~29~~ 11.7 g
40 CuO 3 g Munch A
dipped in $CuCl_2$ & reheated
2.9 - 3.1 - 3.2 - [illegible] - 3.0 - 2.2 - 2.9

# ~~23~~ CuO from acetat
[illegible] [illegible] [illegible] 13.00
- 3.4 - 3.5 -

# 22 ~~Cu~~ cake [illegible] ~~[illegible]~~
(5.25 g.)

22 Plastic under cellu[illegible]
[illegible], no frame
5.3 - 6.2 - 4.0

~~4~~ 10.80 ?
5% lamp black in cellulose
acetate; much A.
First reducing: 6.2 amps. ([illegible])
of [illegible] pieces
2.8 - 3.1 - 2.4 - 3.0 - 1.3? 2.2 - 2.1

~~X~~ 10% lamp black in cellulose
acetate much A. ; 10.6
First reducing 5.9 amps ([illegible])
After " [illegible] [illegible]
1.8 - 1.6 - ~~7~~4 - 2.0 -

# 7 8.3g
CuO ([illegible] Ck.) with 10% Charcoal
40 > 100 mesh Ball [illegible] B
5.60 AH for first [illegible]
1.8 - 2.5 - 1.0 - 2.0

~~8~~ 6.05g
CuO ([illegible]) with 15% char-
coal 40 > 100 mesh, Ball [illegible] B
3.9 AH for first reduction
1.5 - 2.0 - 1.0 - 1.8 - 1.4
51%

~~9~~ 6.85g
CuO ([illegible]) with 10% Charcoal
40 > 100 mesh Ball [illegible] B
4.65 AH for first red.
1.5 - 2.0 - 1.0 - 1.5 - 1.0 - 2.6 - 2.4
2.0 - 2.1 - 2.2 -
(56%)

~~12~~ 8.35 g
CuO ([illegible]) with 10% MnO₂
Ball mill B
5.75 AH for first reduction
2.5 – 2.5 – 2.0 – 2.0 – 1.8 – 1.5
50%

~~11~~ 9.2 g
Precipitated Cu with 5% Charcoal
40 x 100 mesh Stirred with Soda
First reduction: 5.8 (9?%
Oxidation: 2.6 – 2.5 – 2.4 – 2.5
46%

~~10~~ 10.75 g
Precipitated Cu with 5% Charcoal
48 x 100 mesh Ball mill B.
First reduction
Oxidation 3.1 – 3.0 – 2.4 – 2.8
2.5 – 2.6 – 2.6

20 9.0g
Precipitated Cu with 10% Charcoal (453 > 100)
Much with Soda
First reduction 5 [illegible]
Oxydation: 2.6 - 2.5 - 2.0 - 1.8 - [illegible]
2.4 - 2.1 - (50%)

31 9.9g
Precip Cu with 10% Charcoal [illegible]
Ball much B
First reduction
Oxydation 3.0 - 2.6 - 2.0 - 2.0. 3.2
2.6 - 2.6 (47 %)

33 6.55g
Prec Cu with 20% Charcoal (400 > 100)
Much B
First reduction 4.2 (95.8%)
Oxydation. 2.0 - 2.0 - 1.5 - 1.5 - 1.8
1.7 - 1.4 (45%)

Clean – light blue.
Spongy stuff from Kathode, covers the bottom

Clean – yellow –
[illegible] stuff on Platinum, bottom almost free

~~# 2~~ 5.6 g
Pure Cu with 30% Charcoal 80×7 cm
Bake much Pb
First reduction 3.4 (90.5%)
Oxydation: – – Broke during oxydation.

~~# 10~~ 9.7 g
This and following plates burned (carbonized) in powder of charcoal
5% Charcoal 95% CuO. with Coke
Tarpitch in Benzol (after burning reduced in H) poor contact.
1.5 – 1.6 – 1.5 – 1.5 – 2.8 – 2.6 – 2.8 – 2.9 – 1.8

~~# 17~~ 10.1 g
as # 10
4.9 – 4.6 – 2.5 – 5.8 – 3.8 – 1.5 – 2.5
(72) (67.5)

Intensive blue on bottom
clean - yellow - intensive red.
Free from Kath. over bottom.

Blue on bottom (1/4")
grey - yellow - red
some free from Kath. on bottom.

Blue streaks from bottom/High red, bottom
rather free

30 14.1g
5% Charcoal; 95% Prec. Cu.
(Tar) Wood Pitch in Benzol
(reduces, after burning, in H)
2.3 - 5.4 - 4.7 - 5.5 - 5.4 - 5.6

21 13.95g
As # 30.
2.3 - 5.7 - 5.1 - 5.5 - 5.4 - 5.1 -

18 (14.6g)
5% Charcoal; 95% Cu prep.
Ball mill A. (in H)
2.3 - 5.7 - 5.1 - 5.6 - 5.1 - 5.6 - 5.[illegible]

Dark blue on bottom
High red - not much on bottom

x yellow - deep red
Plenty prec on Kath and bottom.

x Like #27.

~~9~~. 13.55
5% Charcoal, 95% Cu prep.
Ball much A
2.3 - 5.7 - 4.8 - 5.5 - 5[illegible]

~~27~~ (14.8)
As #9 & #18
2.3 - 5.7 - 5.1 - 5,6 - 5[illegible] - 5[illegible]

~~1~~ 12.7 g
as ## 9. 18. 27.
7.8 - 3.5 - 3.6 - 2.7 - [illegible]

x yellow – high red.
Plenty pcc. on Kath and bottom

Dark blue on bottom.
Subtransparent brownish red.
Pcc on Kath & bottom

Blue from bottom upward.

24 10.85g
5% Charcoal 95% CuO ([illegible] Ox)
[illegible]
1.3 - 1.6 - 2.0 - 1.5 - 1.9 -

32 (9.9)
as # 24
1.4 - 2.5 - 2.3 - 2.1 - 2.5 2.2

8 (9.65g)
as ## 24; 32
1.3 - 3.5 - 2.[illegible] - 2.0 - 2.3 - [illegible]

11 9.0g
as ## 24, 32; 8
1.8 - 2.0 - 1.8 - 2.8

#37 8,8 g.
95% Cu powder. 5% Charcoal
Pellets in Benzole,
3.0 - 7.6

3 Weight reduced 13.1 g
Plate washed & dried
5.6 - 5.1 - 5.1 - 5.6 - 5.[illegible]

35 Plate of [illegible], 10%
Charcoal 40 > > 400 mesh. Plate [illegible]
weight 8.7g — dropped in
[illegible] and washed
4.4 - 5.1 - 2.6 - 2.2 - 2.3, 1.1 —
7.52 87% -

13.7 g

36 10% Charcoal

30% [illegible] [illegible] – [illegible] Romer

Mich A

3.9 – 3.1 – 4.5 – 3.[illegible]

29 9.5 g

10% Charcoal "

3.9 – 3.5 – 3.8 – 4.[illegible] – 4.1 – [illegible]8

31 8.4 g

10% Charcoal "

2.6 – 2.4 – [illegible] –

very clean, no precips on bottom

Clean

Clean.

#5 Silv Cake shrink with Hydr Potass 16.1 g
Res 10.2 AH
5.2 - 5.2 - 5.5 - 5.2

#6 14.3 g
Cut Silv Clean, shrink in Hydr Potass
Res. 9.0 AH ; Ox 4.6 = 48%
-4.2 - 3.9 - 3.7 - 4.0

#12 Silv Cake shrunk with Cyanic ammonium 16.0 g
Res = 9.9 AH. Ox = 4.6 = 43%
4.2 - 3.9 -

Clean

38   14.0 g
Silv. cake stir'd with
cupric ammonia
1 Red = 9.0 All
Ox = 4.2 All = 44.5%
4.0 - 5.4 - 3.0 - 3.0

" 39   10% Cuprous 90%
Silv cake Ball mill
Repeated — ag NO3 washed
8.8 g Red 5.0 = 85%
Ox = 2.5 = 42.5% — 3.0 - 2.1 - 2.1

" ~~40~~ 90% Cu Prec 10% Char-
coal heater 40 - 100 mesh, Cupr
ammonia 11.95 g

#~~33~~ 9.2 g
10% Charcoal - Silv. Ox. Ball mixed
dipped in AgNO3 and washed
2.6 - 1.0 - 2.6 - 1.2 -

#~~23~~ 7.6 g
20% Charcoal; 80% Cu free
burner (oxydized) struck in
Cupr Ammonia

#~~84~~ 12.2 g
Silv. Ox. struck with
Ammonia; Dipped in
AgNO3 and washed.
= 3.6 = 4.4 - 3.1 = 3.2

20 14.6 g
Silv. Ox. struck with KOH
Dipped in AgNO3 and washed
4.5 - 4.2 - 4.1 - 4.0 - 4.8
4.4 - 4.5 =

g1 - ~~67~~
g2 - ~~67~~ ~~70~~ 75
1 - ~~65~~ 69
2 - ~~67~~ 70
3 - 75 72
4 - ~~67~~ ~~68~~ 77
5 - ~~64~~ 69
6 - 68
7 - ~~67~~ ~~70~~ 72
8 - 67
9 - ~~64~~ ~~69~~ 77
10 - ~~66~~ 78
11 - ~~62~~ 74
12 - 62
13 - ~~65~~ 70
14 - 67 - (7.)
15 - ~~67~~ ~~70~~ ~~71~~ 79
16 - ~~65~~ 72
17 - ~~65~~ ~~69~~ ~~72~~ 71
18 - ~~66~~ ~~70~~ 76
19 - ~~64~~ ~~69~~ 74
20 - ~~64~~ ~~70~~ 71
21 - ~~64~~ ~~69~~ 80
22 - ~~67~~ 69
23 - ~~65~~ 69
24 - ~~65~~ ~~71~~ 77
25 - ~~66~~ ~~69~~ 76

26 - ~~66~~ 69
27 - 68
28 - ~~68~~ 79
29 - ~~68~~ 76.83.
30 - ~~65~~ ~~70~~ ~~71~~ 78
31 - ~~68~~ 80 ?
32 - ~~68~~ 75
33 — 80
34 78